Today's Lecture
2/20/09

Chapter 7.1

- Symbolizing English Arguments
- **□ and □**

Atomic vs. Compound Statements

- An **atomic statement** is one that does not have any other statement as a component.

  Examples
  - Grass is green.
  - The UCen is next to the lagoon.
  - Life is good.

- A **compound statement** is one that has at least one atomic statement as a component.

  Examples
  - It is false that grass is purple.
  - The UCen is next to the lagoon and I am hungry.
  - If life is good, then we have a reason to celebrate.

Symbolizing the Logical Words

Operator	Name	Translates	Compound Type
~	tilde	not	negation
□	dot	and	conjunction
□	vee	or	disjunction
□	arrow	if-then	conditional
□	double-arrow	if and only if	biconditional

If you don’t memorize what these stand for you will fail the final!

Practice with Symbolizations

~ □ □

Symbolizations

- The weather is not cold and today is Friday.

<u>Scheme</u>

W: the weather is cold

F: today is Friday

~W □ F

- Today is Friday and either Sam does not have a job or Sam has a lot of money.

<u>Scheme</u>

F: Today is Friday

J: Sam has a job

M: Sam has a lot of money.

F □ (~J □ M)

Symbolizations

- Sam has an open weekend unless Sam has a job.

<u>Scheme</u>

O: Sam has an open weekend.

J: Sam has a job.

O □ J

- Sam has neither a job nor an open weekend.

<u>Scheme</u>

O: Sam has an open weekend.

J: Sam has a job.

~O □ ~J

~(O □ J)

Symbolizations

1. Sam has an open weekend or Sam has a job.
2. Sam doesn't have an open weekend.
3. So Sam has a job.

- <u>Scheme</u>

O: Sam has an open weekend.

J: Sam has a job.

1. O □ J
2. ~O
3. So , J

Conditionals

Symbolizing Conditionals

- If Kat is identical to an immaterial soul, then Kat is a ghost.

<u>Scheme</u> S: Kat is identical to an immaterial soul

G: Kat is a ghost

S G

- If Kat is identical to a material body, then Kat is not a ghost.

<u>Scheme</u> M: Kat is identical to a material body

G: Kat is a ghost

M ~G

Some Stylistic variants of 'if-then'

Scheme C: Felix is a cat

M: Felix is a mammal

- If Felix is a cat then Felix is a mammal.
- Felix is a cat only if Felix is a mammal.
- Given that Felix is a cat, Felix is a mammal.
- Felix is a mammal if Felix is a cat

C □ M

Sufficient and Necessary Conditions

Sufficient Conditions

- ‘P Q’ is claiming that the occurrence of P is sufficient for Q.
- A **sufficient condition** is a condition that guarantees that a statement is true (or that a phenomenon will occur).

Necessary Conditions

- ‘P Q’ is also claiming that the occurrence of Q is necessary for P.
- A **necessary condition** is a condition that, if lacking, guarantees that a statement is false (or that a phenomenon will not occur).

Examples

- If Alex knows he has hands, then Alex believes he has hands.

  Knowing something is *sufficient* for believing it.

- Alex knows he has hands only if Alex has good reason to believe he has hands.

  Having good reason to believe something is a *necessary* condition on having knowledge of it.

- Given that one has a conscious pain, one is aware of the pain.

  Being conscious of pain is *sufficient* for being aware of pain.

- You can legally drink only if you are at least 21.

  Being at least 21 is a *necessary* condition on being able to legally drink.

These are all Conditionals (→)

P □ Q

P □ ~(Q □ R)

(P □ Q) □ (Q □ P)

~P □[Q □ (R □ S)]

[Q □ (P □ R)] □ S

(P □ Q) □ (R □ S)

Biconditionals

Symbolizing Biconditionals

- Mia is in her 20’s *if and only if* Mia is between the ages of 20-29.

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<u>Scheme</u> M: Mia is in her 20’s

A: Mia is between the ages of 20-29

M □ A

- Jones is a bachelor *if and only if* Jones is unmarried and Jones is male.

<u>Scheme</u> B: Jones is a bachelor M: Jones is male

R: Jones is married

B □ (~R □ M)

Symbolizing Biconditionals

- Mia is in her 20's ***just in case*** Mia is between the ages of 20-29.

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Scheme M: Mia is in her 20's

R: Mia is between the ages of 20-29

M □ R

- Jones is a bachelor ***just in case*** Jones is unmarried and Jones is male.

Scheme B: Jones is a bachelor M: Jones is male

R: Jones is married

B □ (~R □ M)

An example: Utilitarianism

- Helping other humans is morally right if and only if helping other humans yields more pleasure than pain in the world.

- <u>Scheme</u> H: Helping other humans is morally right

  P: Helping other humans yields more pleasure than pain in the world.

  .

  H □ P

These are all Biconditionals (↔)

P □ Q

P □ ~(Q □ R)

(P □ Q) □ (Q □ P)

~P □ [Q □ (R □ S)]

[Q □ (P □ R)] □ S

(P □ Q) □ (R □ S)

Symbolizing the Logical Words

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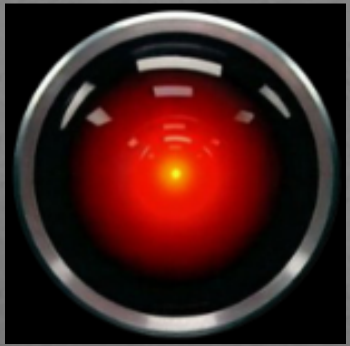
Practice with Symbolizations

~ □ □ □ □

If Robotron 2000 uses concepts, then Robotron 2000 has a natural language. But Robotron 2000 does not have a natural language. So either Robotron 2000 does not have concepts or it uses a different system of representation.

<u>Scheme</u> C: Robotron 2000 uses concepts; N: Robotron 2000 has a natural language; D: Robotron 2000 uses a different system of representation.

1. C □ N
2. ~N
3. So ~C □ D



#61 pg 289

If Dostoyevsky was right, then everything is permissible if God does not exist. But it is not true that if God does not exist, everything is permissible. Therefore Dostoyevsky was not right.

<u>Scheme</u> D: Dostoyevsky was right; E: Everything is permissible; G: God exists

1. D □ (~G □ E)
2. ~ (~G □ E)
3. Therefore ~D